

The background features a large, translucent green glass sphere on the right side, with several smaller green glass spheres floating in the air to its left. White, curved lines sweep across the scene, suggesting motion or a design process. The overall aesthetic is clean and modern.

New Features in Gameware

Ankur Mohan
Product Manager, Gameware



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AUTODESK®
SCALEFORM®

User Interface

AUTODESK®
HUMANIK®

Inverse Kinematics

AUTODESK®
GAMEWARE NAVIGATION

Next-Generation Pathfinding

AUTODESK®
BEAST™

Global Illumination

Autodesk® HumanIK®

With Autodesk® HumanIK® developers can create more believable, interactive character animations in games. HumanIK features:

- Full body IK
- Real-time retargeting
- Foot contacts
- Look At and Reach controls

Higher quality animation =
More believable experiences



Images courtesy of Ubisoft, *Assassin's Creed*.

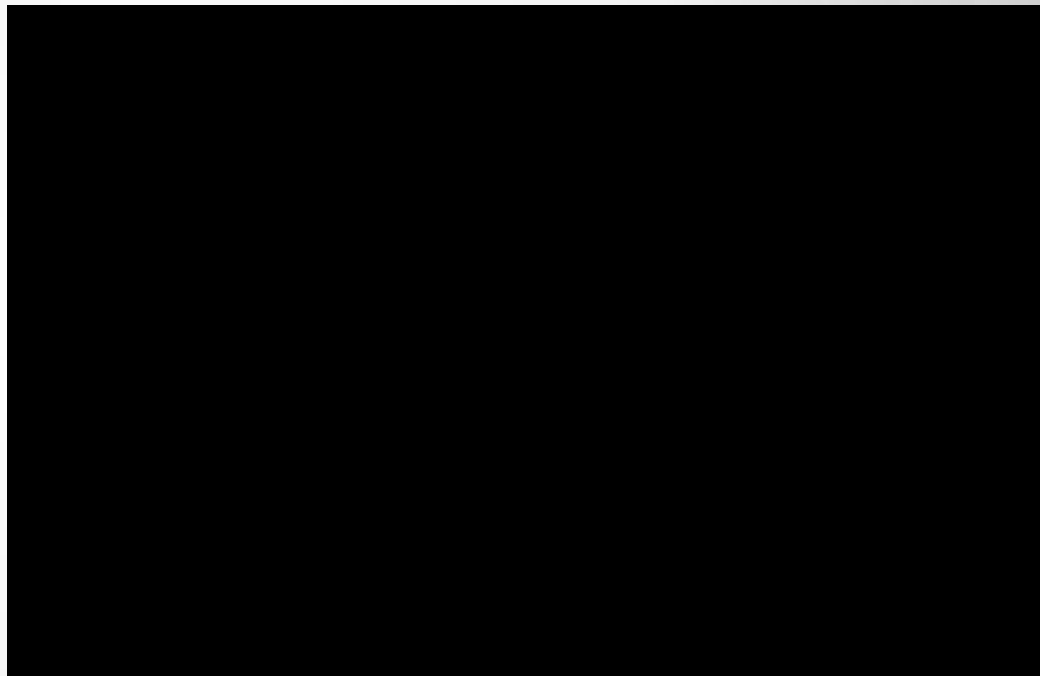
Key Features

Foot contacts

- Run-time contact for feet, hands fingers and toes
- Customizable
- Adapts to dynamic environments

Look At controls

- Blendable look at targeting
- Can combine with Full-body IK
- Works with limbs



Latest Features

- **Creature Solver:** enables IK computations on non-human creatures with multiple limbs, tentacles, antennae, or mandibles.
- **Integration with Unreal Engine 4**
- **Improved performance on mobile platforms:** Apple® iOS, Android™ ARM, and Android™ x86 operating systems.
- **Improved performance on next-gen platforms:** enables animating hundreds of characters in-game on the Sony® PlayStation® 4 and Microsoft® Xbox One® platforms.



HumanIK

Creature Solver



AUTODESK® GAMEWARE

Autodesk® Gameware Navigation

Autodesk® **Gameware Navigation 2015** is a next generation ready low-level AI SDK.

- Automatic, robust and fast NavMesh generation
- Animation-driven locomotion
- Pathfinding and path following
- Remote visual debugging tools

More realistic AI behaviors =
More immersive game experiences



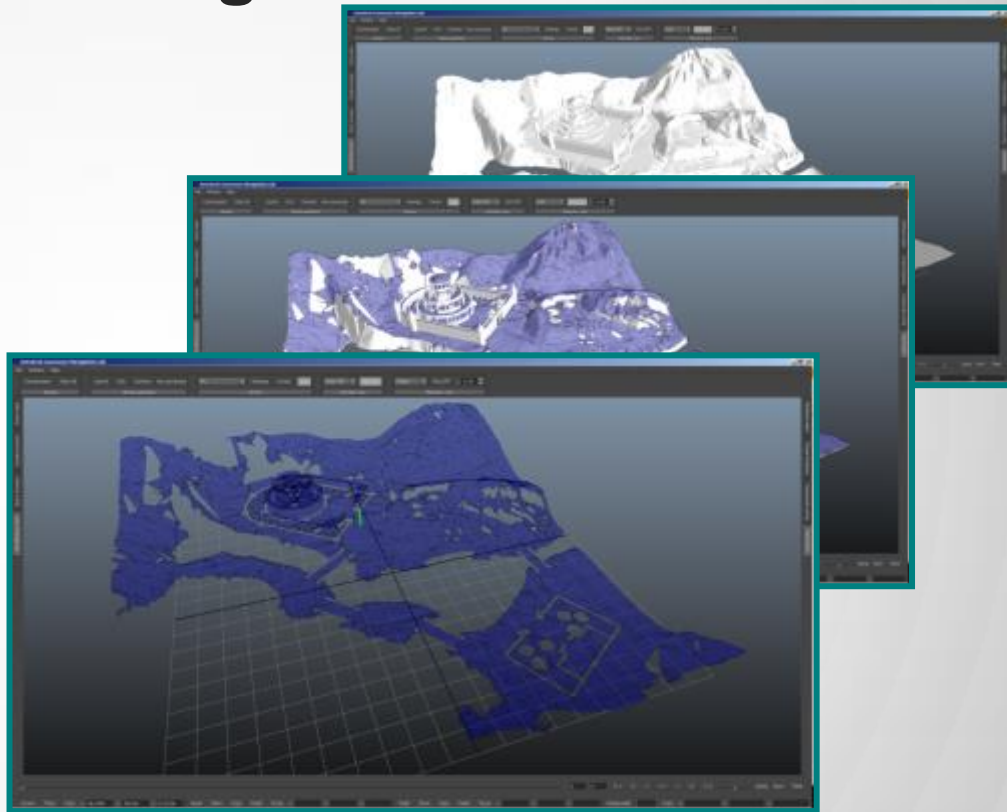
Images courtesy of CCP
Games, EVE Online.

Autodesk® Gameware Navigation

Key Features

NavMesh Generation

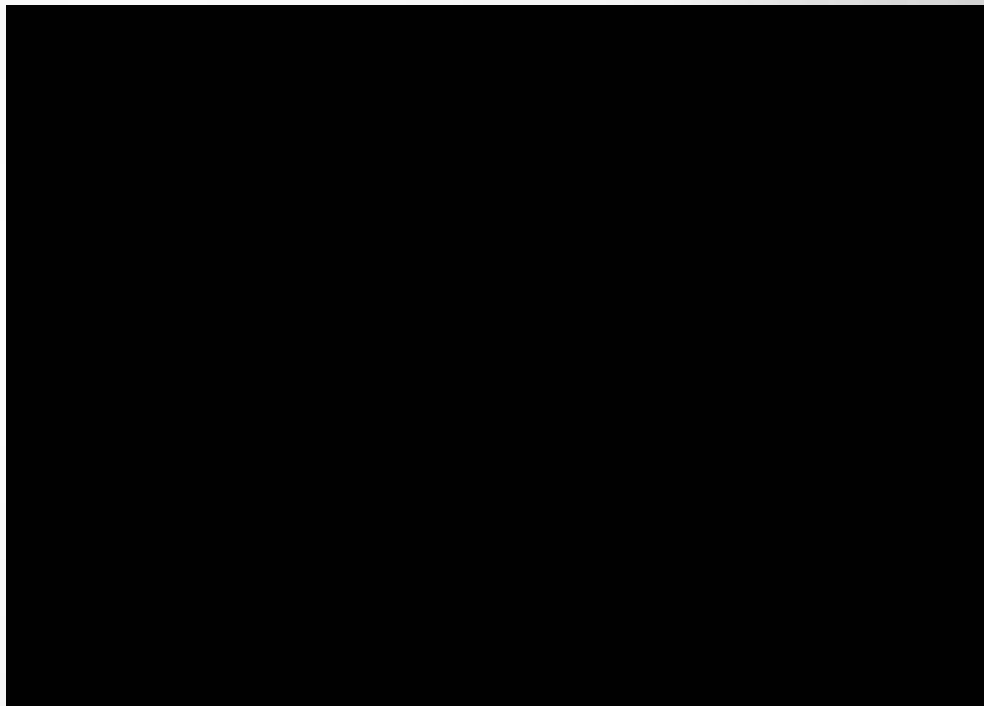
- NavTag (Ex. embed and “paint” the NavData with your own custom information)
- Collaborative workflow
- Multithreaded NavData generation



Key Features

Runtime Navigation

- Dynamic Avoidance
- Animation-driven locomotion
- Smart objects (Ex. Doors, elevators)
- NavData streaming
- Dynamic NavMesh
- Time-slicing



Autodesk® **Gameware Navigation**

Latest Features

- Animation-driven locomotion
- Robust dynamic NavMesh
- Hierarchical pathfinding
- Improved support for mobile platforms: Apple® iOS, Android™, Windows Phone®, and Windows® Surface™
- Unity Engine integration



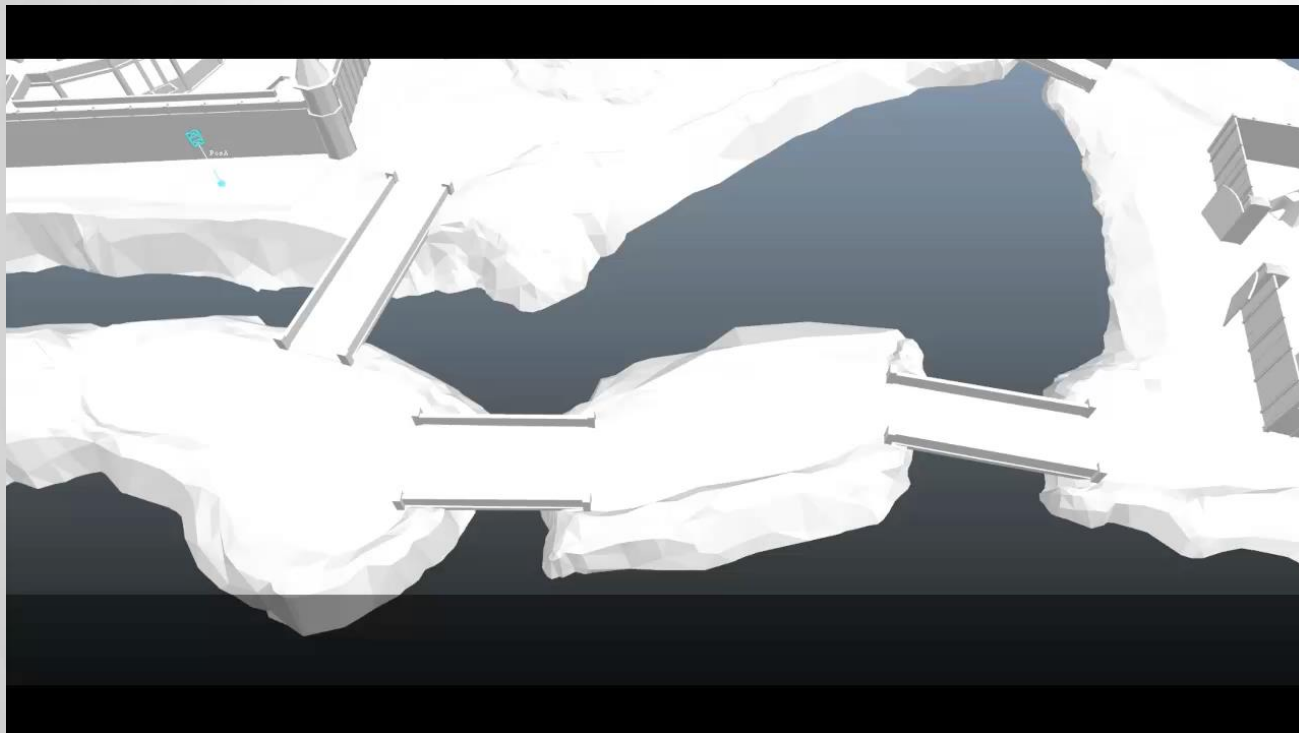
Autodesk® **Gameware Navigation**

Abstract Graph



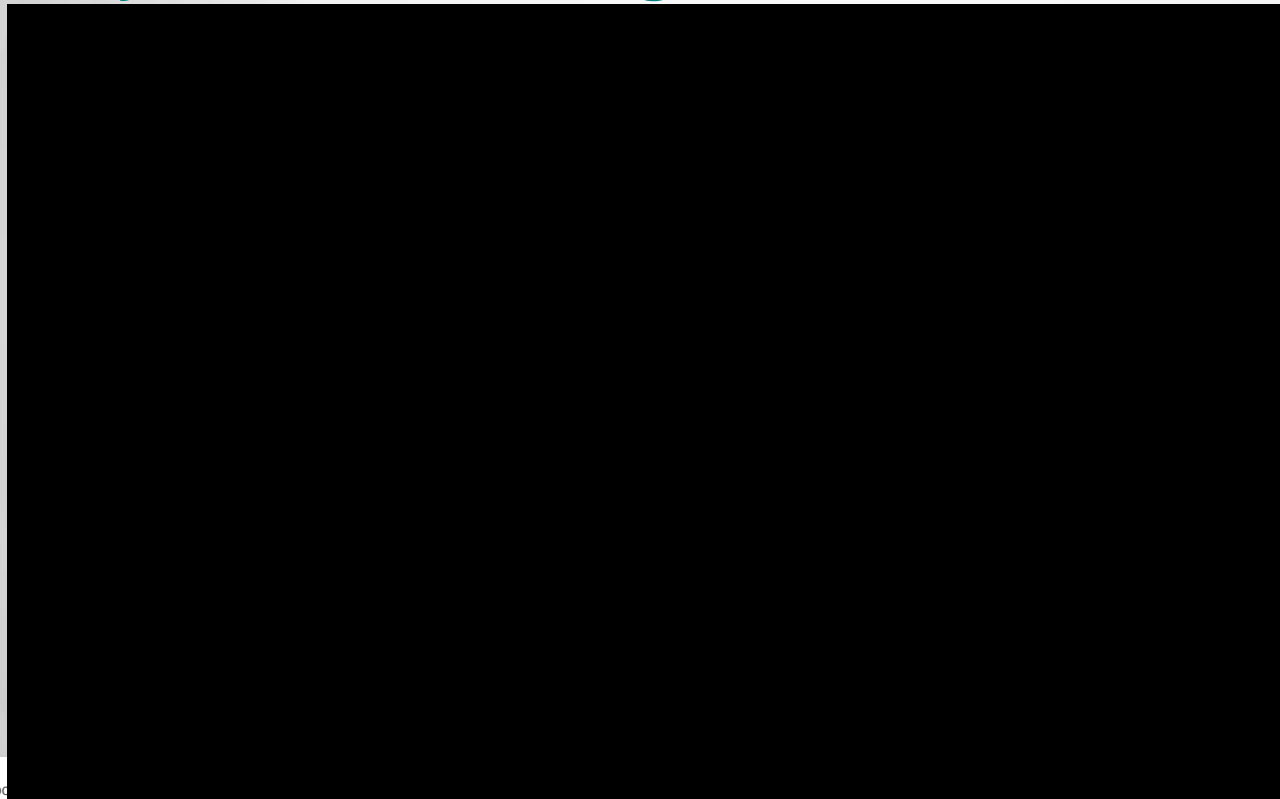
Autodesk® Gameware Navigation

Animation Driven Locomotion



Autodesk® **Gameware Navigation**

Unity and Mobile Integration



Autodesk® Scaleform®

Autodesk® Scaleform® 4.4 is an advanced, cross-platform user interface solution:

- GPU accelerated 3D graphics technology
- Seamless integration with the proven productivity and workflow of Adobe® Flash®
- Optimized for speed and performance on game consoles

High quality UI =
High value production

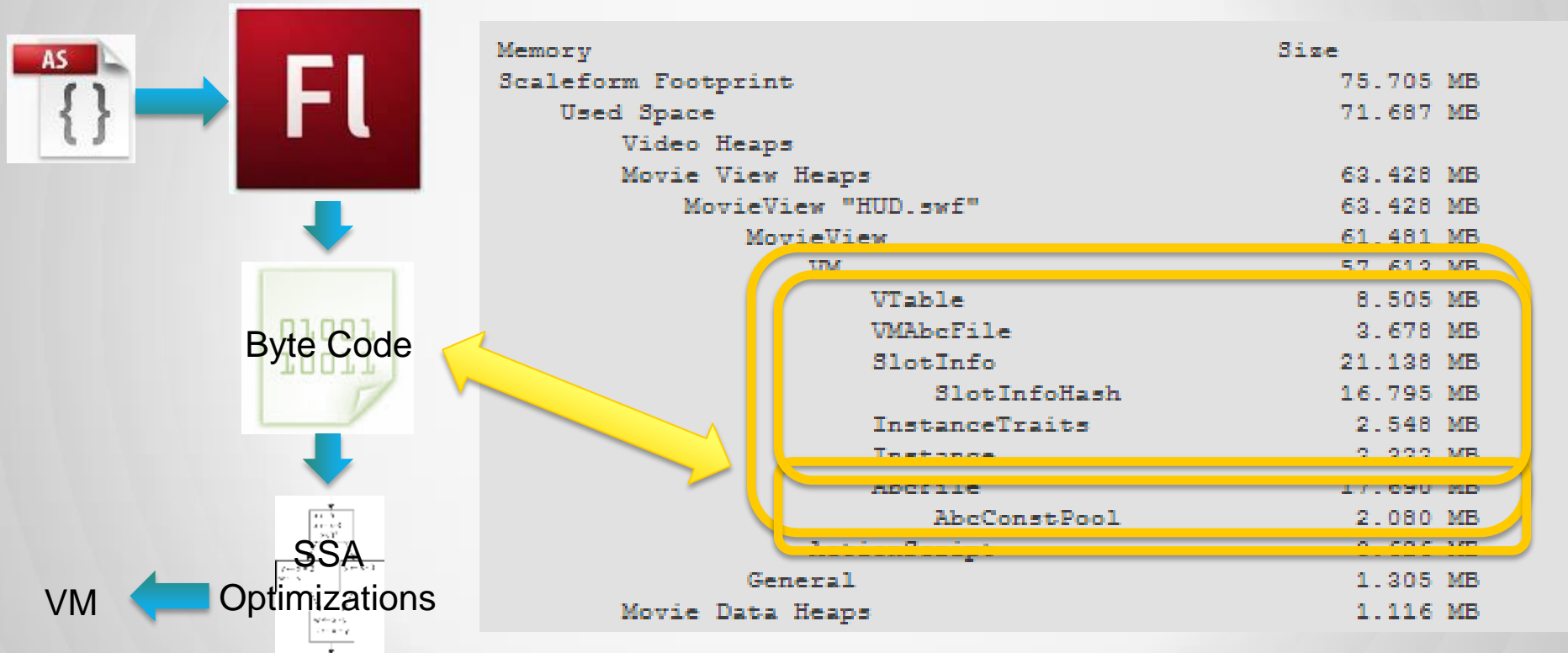


Image courtesy of Bioware, *Dragon Age*.



Image courtesy of Blizzard Entertainment, *Starcraft II*.

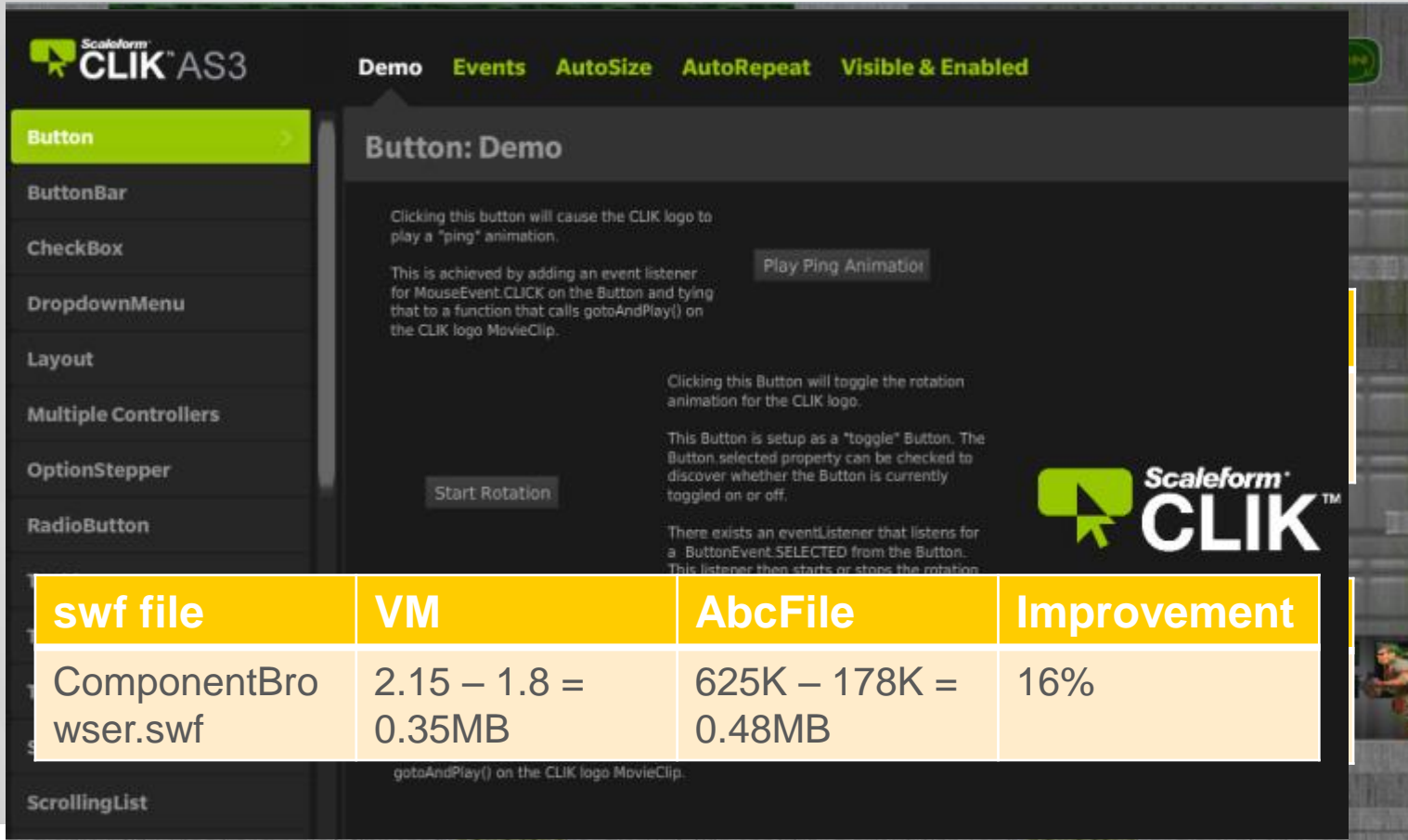
Actionscript Improvements



Actionscript Improvements

- Reduce runtime memory consumption
 - Mainly achieved by parsing bytecode on demand
- Improve runtime performance
 - Can occur at the expense of slightly increasing runtime memory consumption

Runtime Memory Improvements



The screenshot displays the Scaleform CLIK AS3 demo interface. On the left is a sidebar with a list of UI components: Button, ButtonBar, CheckBox, DropdownMenu, Layout, Multiple Controllers, OptionStepper, RadioButton, and ScrollingList. The 'Button' component is selected and highlighted in green. The main area, titled 'Button: Demo', contains three sections of text and two buttons. The first section explains that clicking the button causes the CLIK logo to play a 'ping' animation, achieved by adding an event listener for MouseEvent.CLICK. A 'Play Ping Animation' button is present. The second section explains that clicking the button toggles the rotation animation for the CLIK logo, achieved by checking the Button.selected property. A 'Start Rotation' button is present. The third section mentions an event listener for ButtonEvent.SELECTED that starts or stops the rotation. The Scaleform CLIK logo is visible on the right. Overlaid on the bottom of the screenshot is a table with four columns: 'swf file', 'VM', 'AbcFile', and 'Improvement'. The table shows a 16% improvement in VM size for the ComponentBrowser.swf file.

swf file	VM	AbcFile	Improvement
ComponentBrowser.swf	2.15 – 1.8 = 0.35MB	625K – 178K = 0.48MB	16%

Byte Code Optimization

- Optimizer Improvements
 - Internal Bytecode Representation
 - Convert original byte code into graph based internal representation (IR)
 - Apply optimizations to IR
 - Generate new optimized byte code
 - If an expression can be evaluated to a constant, replace conditional with a jump
 - Dead code elimination
 - Type Conversion of Method Argument

```
function GenericFunc(num:Object)
{
    trace("num = " + num);
}
GenericFunc(1.0);
```

Performance Improvements?

- Roughly 25% performance improvement in preliminary tests. Of course actual results will depend on content.

swf file	FPS	Improvement
Doom2D	46/54	17%
clumping_as3.swf	130/155	19%
3DInventory.swf	560/720	28%

Performance Improvements?

- Expected trade-off between performance improvement and VM memory savings

swf file	Version	FPS	FPS	VM Mem
Doom2D	4.3	46		
	4.4 (a)	54	17%	-5.47%
	4.4 (b) *	62	35%	-4.05%
ObjectCell	4.3	88		
	4.4 (a)	103	17%	-4.3%
	4.4 (b)	126	43%	2.83%

*

- Object Cloning
Store object layouts so that Objects don't have to be constructed from scratch
- Object Pooling:
Keep copy of recently used objects in memory to speed up object creation

New Actionscript API

- AMF3: Binary format for serializing Flash objects and data
 - `ByteArray::readObject()`
 - `ByteArray::writeObject ()`
 - `flash.net::getClassByAlias()`
 - `flash.net::registerClassByAlias()`
- Graphics
 - `flash.display.GraphicsBitmapFill`
 - `flash.display.GraphicsGradientFill`
- `Flash.geom.Utils3D`: Simply implementation of certain 3D matrix operations
 - `flash.geom.Matrix3D`
 - `flash.geom.Vector3D`

Engine Integrations

Improvements to Engine Integrations:

- UE4 (PS4, XBox-One)
- Improved Unity Integration
 - Support for Render-To-Texture
 - Replace Flash Texture with Unity Texture
 - D3D11
 - Loading swfs from memory
 - Lots of bug fixes and regular monitoring of forum posts



Recap: Gameware 2014

Beast™

- Physically based lighting
- Distributed lightmap baking
- Artists can change geometry/lights interactively
- Out of the box integration with Maya

Navigation

- Dynamic Navmesh on Mobiles
- Animation Driven Locomotion
- Hierarchical Pathfinding
- Remote Visual Debugging
- PS4, XB1 support, Unity Intergration

HumanIK®

- Creature solver for poly-peds
- Low LOD solver
- UE4 Integration

Scaleform®

- Actionscript VM optimizations, ~25% performance improvement
- Improved AS3 Coverage

Autodesk®

Gameware 2014

Connect Navmeshes by smart objects



Use Navlab for remote debugging

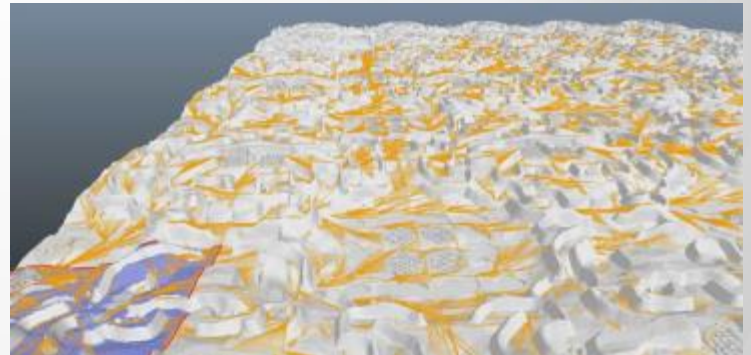


Animation driven Locomotion



Navigation

Hierarchical pathfinding



Gameware 2014

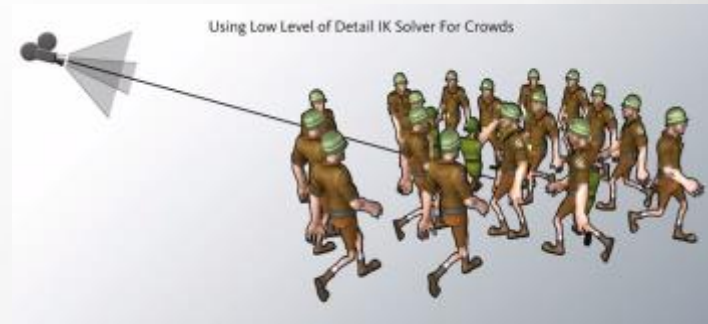
Not limited to Bi-peds any more!



HumanIK®



Low LOD for Crowds



Gameware 2014

High quality lighting, consistent across platforms



Interactive Preview

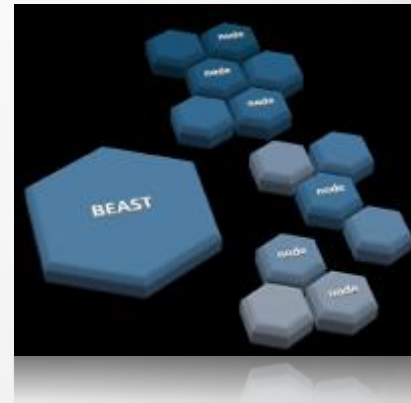


Near real time workflow for the artist



Beast[™]

DistriBeast: Distributed computation of lightmaps



Gameware 2014

VM Optimizations: ~25% Improvement

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Doom2D	46/54	17%
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Multithreaded Rendering

Scaleform®

Improved Actionscript Support

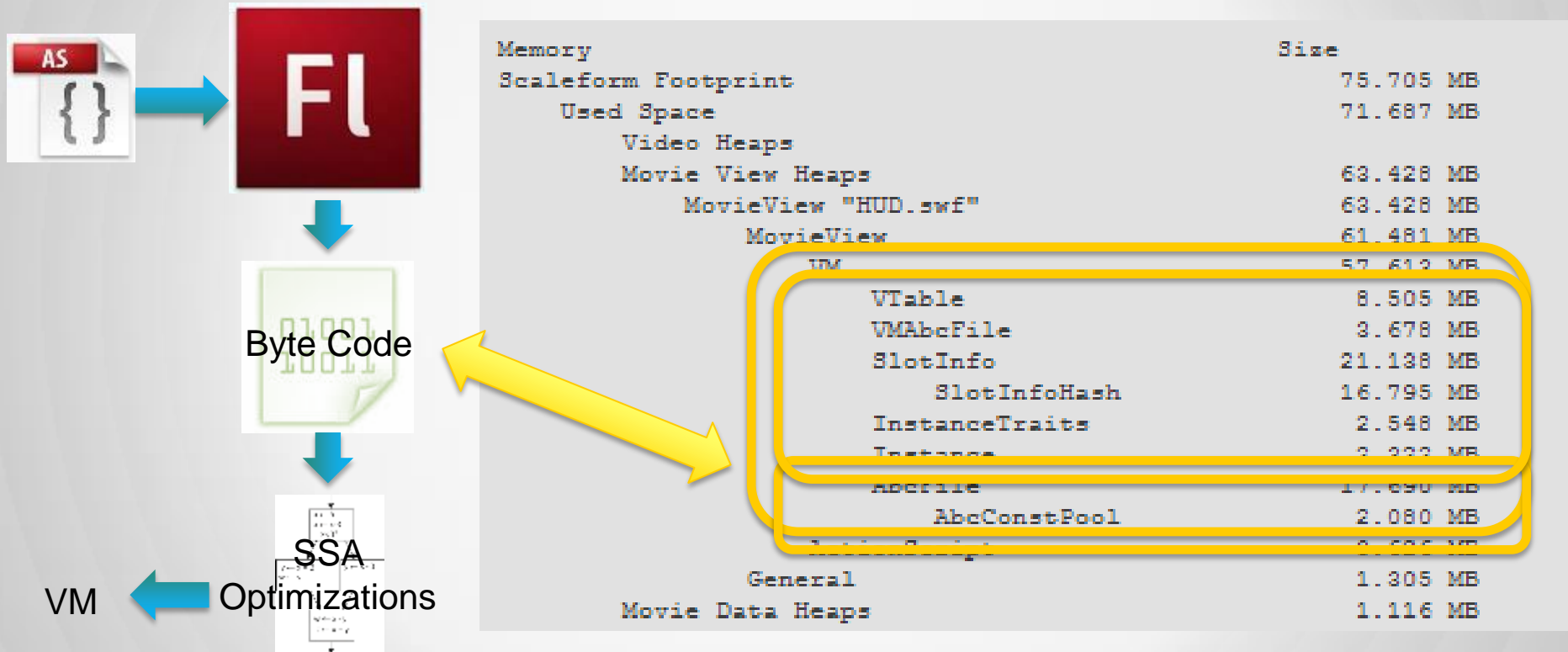
- Action Message Format
- Graphics API

GL ES 3.0 Support

UE4 Support, Improved Unity
Integration



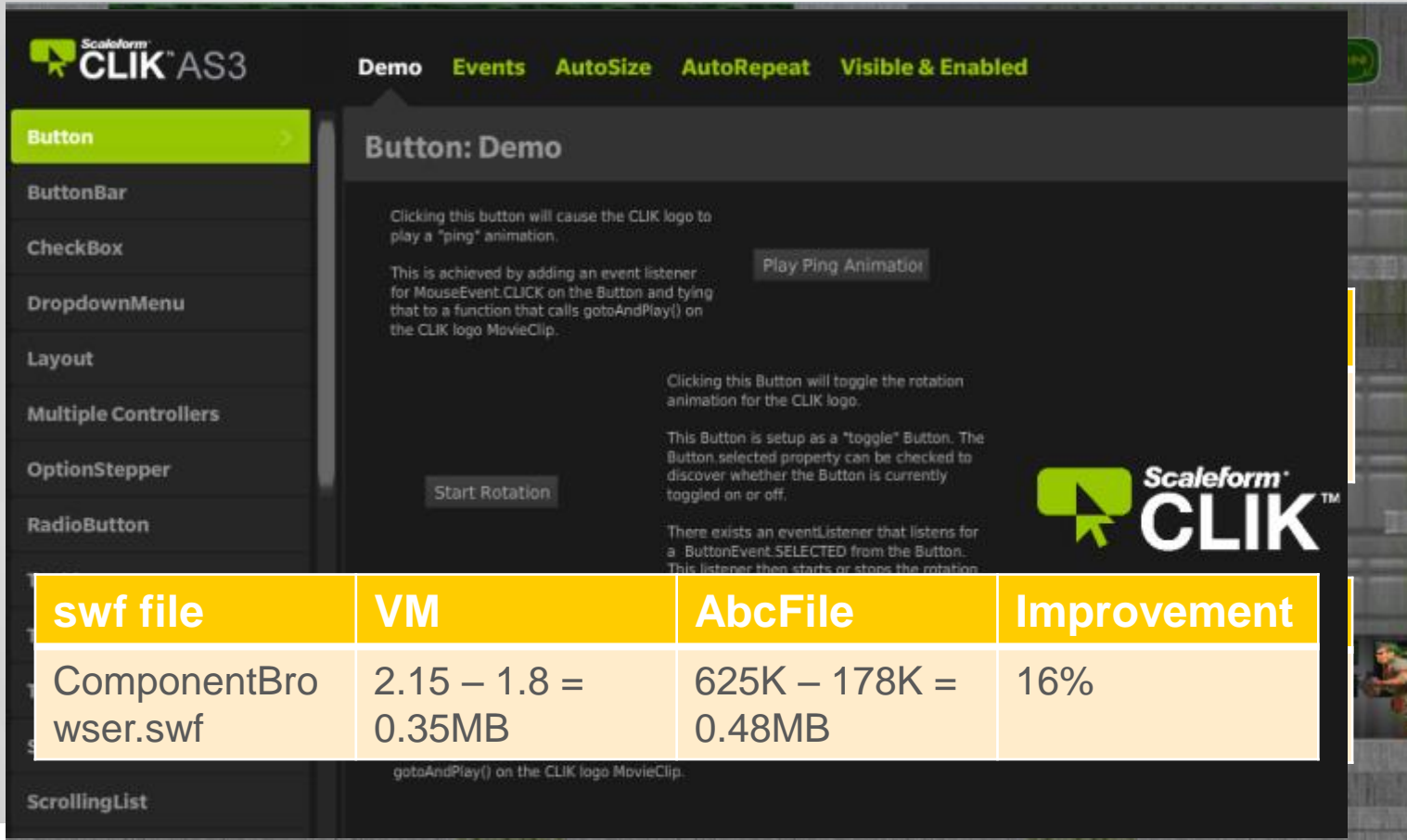
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The screenshot shows the Scaleform CLIK AS3 demo interface. The top navigation bar includes 'Demo', 'Events', 'AutoSize', 'AutoRepeat', and 'Visible & Enabled'. The left sidebar lists components: Button, ButtonBar, CheckBox, DropdownMenu, Layout, Multiple Controllers, OptionStepper, and RadioButton. The main content area is titled 'Button: Demo' and contains three sections of text and buttons:

- Section 1:** 'Clicking this button will cause the CLIK logo to play a "ping" animation.' Below this is a button labeled 'Play Ping Animation'.
- Section 2:** 'This is achieved by adding an event listener for MouseEvent.CLICK on the Button and tying that to a function that calls gotoAndPlay() on the CLIK logo MovieClip.'
- Section 3:** 'Clicking this Button will toggle the rotation animation for the CLIK logo.' Below this is a button labeled 'Start Rotation'.

Further text explains: 'This Button is setup as a "toggle" Button. The Button.selected property can be checked to discover whether the Button is currently toggled on or off.' and 'There exists an eventListener that listens for a ButtonEvent.SELECTED from the Button. This listener then starts or stops the rotation'.

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ScrollingList

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- Graphics
 - Flash.display: set of methods used to draw graphics objects
- Flash.geom.Utils3D